EFFECT OF EXPERIENTIAL LEARNING ON ACADEMIC ACHIEVEMENT, LEARNING STYLES AND REFLECTIVE OBSERVATION IN SCIENCE OF SECONDARY LEVEL STUDENTS

Synopsis

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Submitted by

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1.0.0 INTRODUCTION

Learning is a lifelong process. As students, instructors, parents, and other human beings, we all learn new things. In order to build the skills, accomplishments, and interests in the students for their success, scientific education has been looking for innovative methods of teaching and learning over the years to move away from the conventional board & paper processes. One technique that satisfies this need is the experiential learning approach. For today's youngsters, who spend a large portion of their schooling imprisoned in little rooms called classrooms, real-world experiential learning has the potential to be profoundly transformational.

In a world characterized by fast technological advancement and globalization, children must be able to do much more than just be able to count, read, and write. Children require educational opportunities that accurately reflect real-world situations and are constructed to purposely emulate how society functions outside of traditional classroom settings. It is understandable that science's pedagogy is changing as the field shifts its emphasis to innovation. The way STEM (Science, Technology, Engineering, and Mathematics) topics are learned and taught has drastically changed over the past ten years, moving more towards a practical, hands-on, and experiential approach.

There should be plenty of these learning opportunities used while teaching science as a topic. The learning activities must be age-appropriate, pertinent, understood locally, and used by the students themselves. Giving students experiences that are thus locally pertinent facilitates and enhances concept acquisition. Since the students will be able to readily link experience and the subject matter on their own, the learning created in this way will be lasting and tangible. The learners would find it easy and exciting to find the new knowledge and can readily grasp the same if the experiences are chosen from the familiar local surroundings.

Kolb (1984) has rightly identified ‘‘Experiential learning as a specific approach to enhance and arouse creativity and interest in students in the process of learning’’.

The knowledge that students gain during the learning process comes from the experience they gain on their own. The instructor serves as a scaffold, facilitator and provides experiences to the students so that they may connect those experiences to the topic being discussed and with their life. As a result, the teaching-learning process is made easier and more accommodating, and the students produce more

accomplishments and other activities. For students to do well in science, they need to grasp the importance of science, enjoy the process of doing experiments, and maintain their interest in the subject. Students in schools need to learn the ideas that come from witnessing scientific occurrences and carrying out their own practical studies.

1.1.0 EXPERIENTIAL LEARNING

Learning by doing or via direct experience are two terms used to describe experiential learning. It is a method of instruction that gives students the chance to learn via hands-on experience, reflects on those experiences to gain new knowledge and abilities, and adopt new attitudes and ways of thinking, all of which will help them to comprehend the topics being taught better. The primary goal of experiential learning is to provide activities that serve as a foundation for experience. Following that, participants can participate in the activity, consider what they learned, and create new knowledge (Knapp, 2001). Experiential learning is seen as a successful method to education since it may have an impact on how learners build their meta cognitive and implementation abilities by putting their knowledge to use in real-world circumstances and giving them the chance to learn for themselves. It's a learning method that has been thoroughly studied for many years and has been proven helpful for students of all ages. According to Kolbs (1984): “Experiential learning is an engaged learning process whereby students “learn by doing” and by reflecting on the experience”. Research shows that experiential learning focuses on the learning process of an individual learner (Gross and Rutland, 2017). It is a method wherein students "learn by doing" and whereby first-hand experiences produce knowledge, unique talents, and democratic principles.

John Dewey mainly contributed to experiential learning by emphasizing on ‘learning by doing’ or ‘learning by experience’. John Dewey coined the term ‘learning by doing’ (Dewey, 1915).

Activities that promote experiential learning include fieldwork, classroom activities, off-site school trips, project-based learning, field activities, experiments, simulations, field trips, learning projects, outdoor education, group work in and out of the classroom, open-ended discussion activities, and open-ended questioning guidance. According to research, students of all ages learn more effectively when they use ideas in practice to solve issues of the real world, actively make decisions, and then consider the results or implications of their learning actions and decisions.

According to C. Beard and J. Wilson (2018): “Experiential learning can be defined as a sense making process of active engagement between the inner world of the person and the outer world of the environment.

Experiential Learning in Science

In teaching science, organizing experiential activity is to provide students with opportunities to observe and experiment; to apply knowledge; to solve theoretical and practical problems; to discover and explore science, through which they can continue to improve their skills and achievements. Via experiential learning, the aims of teaching science are to link students to the realistic situations.

The National Education Policy (NEP) 2020 outlines the vision of India’s new education system. It provides a comprehensive framework to address the ‘learning crisis’ by making education accessible, equitable and inclusive. An important objective of the NEP is to foster ‘experiential learning and critical thinking’ among students. The concept of experiential learning was popularized by education theorist David A. Kolb (2005), who, along with Roger Fry, developed the experiential learning theory. It is based on four key elements which operate during the learning process in a continuous cycle and they are: (i) concrete experience followed by (ii) observation and reflection followed by (iii) forming abstract concepts followed by (iv) testing in new situations.

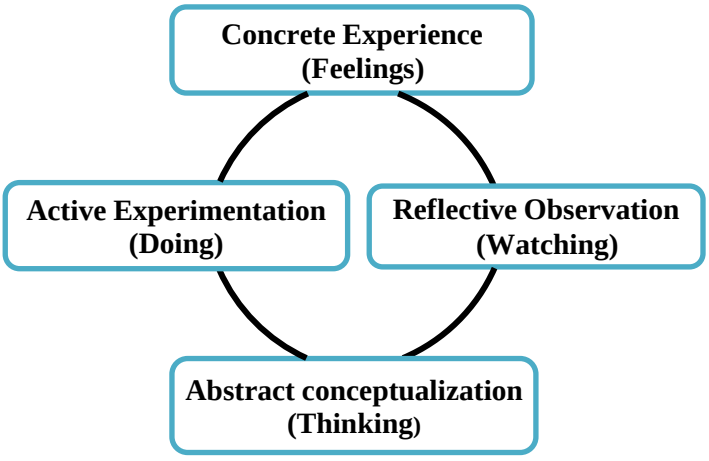

Fig1: Experiential Learning Cycle

From Kolb’s model, it is clear that there are four kinds of experiences or learning cycles which are explained as follows:

i. **Concrete experience (feeling):** It is the experience of trying new things, facing problems, and

stepping out of our comfort zone to learn from our successes or failures.

ii. **Reflective observation (watching):** It is about reflecting on our experiences, both action and feelings. It is a chance to reflect on what went right and what could be improved, and to observe how it could have been done differently.

iii. **Abstract conceptualization (thinking):** Here, students interact with the rational examination of concepts and takes action based on cognitive knowledge of the situation. At this stage, pupils construct their own notions and definitions of the topic. It is when we plan and brainstorm steps for success.

iv. **Active experimentation (doing):** In this situation, the student is focused on acting fully and having an impact on both people and events. At this point, the student is aware of the value of the material and puts the experiment to the test in various scenarios to determine which life skills they need.

1.1.2 ACADEMIC ACHIEVEMENT

Academic Achievement refers to how far a student, teacher, or institution has achieved their short- and long-term educational objectives. Exams or ongoing evaluations are frequently used to assess academic performance. Achievement in science is a test designed to measure the student's degree of correctness after completing a course of teaching. It measures the student's cognitive achievement in the scientific topic.

1.1.3 LEARNING STYLES

The term "learning style" is used to refer to a student's preferred method of identifying and assimilation of knowledge. In other terms, a student's learning style is the way that they appear to learn most often or most efficiently. Academic success of students is significantly impacted by learning style. Every student has a unique learning style. There are several distinct learning styles, including kinesthetic, visual, auditory, reading, and writing. These will assist the students in improving their academic performance throughout their lives.

1.1.4 REFLECTIVE OBSERVATION

The 'reflective observation' stage of the experiential learning cycle is all about reflection on the

experiences, which encompass both action and feelings. We think back on the experiences at this point. We have the opportunity to consider what went well and what may be improved. Additionally, it's a time for everyone to learn from one another and consider how it may have been done differently.

Reflection—the analysis and synthesis of knowledge and activity to create new knowledge" (Indiana University,2006,n.p). Reflection on learning during and after one's experiences is an integral component of the learning process. This reflection leads to analysis, critical thinking, and synthesis (Schon, 1983; Boud, Cohen, & Walker, 1993).

1.2.0 EMERGENCE AND JUSTIFICATION OF PROBLEM

According to NEP (2020): Experiential learning will be implemented at all phases, including hands-on learning, arts- and sports-integrated education, and story-telling-based pedagogy, among others, as standard pedagogy within each topic and with explorations of the relationships between various disciplines. NEP (2020) suggests a hands-on experiential learning approach, often enabling learners to explore topics for holistic understanding across disciplines (interdisciplinary approach). The introduction of experiential and interdisciplinary learning methods would ensure that students will have a more meaningful, holistic and coherent learning experience. Experiential learning and art-integrated education will be incorporated into classroom activities not only to foster a positive learning environment but also to impart the Indian ethos by incorporating Indian art and culture into all aspects of teaching and learning.

According to National Curriculum Framework for School Education NCFSE (2023): Less emphasis should be placed on textbook learning in the world around us and more on hands-on learning with physical exploration serving as the primary content source. Specifics of the Learning Standards, Curriculum Areas, experiential learning, a competency-based approach, formative assessments, and relating to students' context should all be teachers' primary focus areas.

Recommended Pedagogical Approaches NCFSE (2023): Hands on Science

The necessary part of studying science is really "doing science" through practical application. Using the objects around them, fundamental scientific tools (measurement instruments), and lab equipment are all examples of "doing science." Through manipulating, planning, and constructing experiments and demonstrations, students gain conceptual knowledge and grow as individuals. Students will

internalize conceptual knowledge learned in the classroom if a more immersive, experiential learning approach is used.

It is advised that experiential learning be permitted through case studies, site explorations, projects, guided readings, and other similar ways to achieve a comprehensive grasp of all areas with the needed depth.

India's traditional educational approaches have placed an excessive emphasis on memorization and rote learning. This made it possible for students with good memories to earn higher grades even when the teachings or concepts were unclear to them. On the other hand, a pattern that promotes conceptual comprehension can assist students in building upon what they already know and assisting them in making fresh and more meaningful connections between new and old concepts. Experiential learning helps students, develop new connections and problem-solving abilities, reflective observation by fostering critical thinking in them from a young age, as opposed to relying on parental and teacher-provided easy fixes.

How students learn about animals is a perfect illustration of the distinction between conventional learning and experiential learning. In the conventional educational system, students learn about animals by reading what is written in a book and hearing what their teachers have said to them. However, under the experiential approach, students study animals by visiting a zoo or an animal reserve and seeing the creatures in their natural habitat. In contrast to the traditional paradigm, student may learn a lot more and a lot better by observing, engaging, inquiring, and developing appropriate hypotheses about what the animals eat, how they behave in confinement, and how they interact with other animals and the zookeepers.

The science education system should emphasize the practical understanding of the principles of science. Now a day’s our India needs is Scientific Humanism i.e., a concept which involves a progress in achievement in relation to our cultural, economic, social spiritual, ethical and human values. This should be the aim of our school and higher science education. Dogra (2010) explored that various constructivism strategies like, concept mapping, group discussion and brainstorming strategies play a significant role in developing problem solving abilities, critical and reflective thinking, creativity and scientific attitude among students.

“The enormous potential for India to become a leading knowledge power in the coming years can be realized only if our younger generation has opportunities for all round good education and training, especially in Science & Technology. Unfortunately, however the present state of higher education in the country is rather poor. In order to make it more relevant to the changing needs of society, and thus to propel India to a position of leading knowledge power, we need massive investments as well as well-planned radical changes in our higher education system” (Joint Science Education panel,2008).

The constructivist teaching and learning method, as advocated by NCF (2005), should take the place of outdated conventional teacher-dominated "read and remember" and "chalk-n-talk" practices. While current science education fosters more competency, it does not foster the future citizens' originality and curiosity, which are vital components for the development of our country.

Examinations ‘are largely inappropriate for the learning society of the 21st century and its need for innovative problem solver.

It will help students by allowing them to learn by their own pace. This method of learning will help in making class room environment alive.

Experiential Learning being recommended for school-level in the NEP (2020)

It is commendable that the policy talks about introducing ‘play/activity-based learning’ in the foundational (pre-school-grade 2) and preparatory (grades 3-6) stages, and ‘experiential learning’ in themiddlestageandsecondarylevelinordertomakelearningjoyfulandengagingforchildren. NEP2020 talks of specialized faculty, meaning subject- specific teachers for studying abstract concepts in sciences, mathematics, social sciences, in this phase of schooling.

RESEARCH QUESTIONS

1. Can drawbacks of traditional method be solved through instruction by the experiential Learning?
2. How effective will be teaching science through experiential learning on Academic Achievement?
3. How effective will be teaching science through experiential learning on Learning style?
4. How effective will be teaching science through experiential learning on Reflective Observation?

1.3.0 REVIEW OF LITERATURE

Table:1 Review of Literature

Sr. No.	Name of the Researcher	Year	Title of the study	Findings
1	Yardley, S., Teunissen, P.W &Dornan, T.V	2012	Experiential learning: Transforming theory in to practices	The only method available today that can connect theory and practice is experiential learning. The study shows the benefits of hand on activities.
2	Joshi K.H	2015	Effectiveness of Kolb's experiential learning model for IX class students in social science subject.	The research proved that Kolb's Experiential Learning Model (KELM) curriculum works well for instructing IX class students in social science.
3	Alkan F	2016	Effects of Experiential Learning Model on Student Teachers Achievement in Chemistry as well as their Scientific Process Skills.	The experiential learning approach has a favorable impact on students' performance in chemistry and their understanding of the scientific method.
4	Leal-Rodriguez & Albort-Morant	2018	Promotion of innovative experiential learning practices for improving academic performance.	The student's academic performance was improved via a teaching strategy focused on experiential learning.
5	Akarsu, Kariper and Coskun	2014	Impact of science tales on teaching of science and students' performance in academics.	The findings indicated that science fiction has had a big impact on how science is taught and how well children do in school.
6	Nzesei	2015	Relationship between learning styles and academic achievement among secondary students in Kenya.	Learning styles and students' academic success are strongly positively correlated and statistically significant.
7	Ngoc N	2022	Effect and effectiveness of experiential learning on university students.	Experiential learning is essential to the success of both the teaching and

				learning processes.
8	Ariastuti,M.D., &Wahyudin A. Y.	2022	Exploring academic performance and learning style of undergraduate students in English education program	It was completely possible to get to the conclusion that learning style has a statistically significant impact on students' performance.
9	Cheng,S.C., Hwang,G.J., &Chen,C.H.	2019	From reflective observation to active learning: A mobile experiential learning approach for environmental science education.	The experimental findings show that the adopted strategy may greatly improve students' academic performance, environmental attitudes and group efficacy.
10	Shaham.C	2022	Training for Teaching - Reflective Observation of beginning teachers in their first year.	Analysis of the reflections indicates that beginning teachers experience success in diverse ways of teaching and assessment.
11	Narayan.B.B	2019	Teaching science to Standard IX CBSE students through experiential Learning.	Experiential learning improves the effectiveness of science instruction and changes the environment's routine.

After going through all these literatures, the researcher observed that most of the researches have been done on effect of experiential learning on academic achievement, learning styles and reflective observation.

So, the researcher has taken up this study on academic achievement, learning styles and reflective observation of students of secondary school.

1.4.0 STATEMENT OF THE PROBLEM

To investigate the EFFECT OFEXPERIENTIAL LEARNING ON ACADEMIC ACHIEVEMENT, LEARNING STYLES AND REFLECTIVE OBSERVATION IN SCIENCE OF SECONDARY LEVEL STUDENTS.

1.5.0 DEFINITIONS OF THE TERMS USED

EXPERIENTIAL LEARNING

According to C. Beard and J. Wilson, (2018) "Experiential learning can be defined as a sense making process of active engagement between the inner world of the person and the outer world of the environment.

Operational Definition: It is the method of teaching where students learn through experience, observation and active participation.

ACADEMIC ACHIEVEMENT

Crow and Crow (1969): Defined Academic Achievement as the extent to which a learner is profiting from instructions in a given area of learning i.e., achievement is reflected by the extent to which skill and knowledge has been imparted to them. (as cited in **Lawrence, A. S., & Deepa, T. (2013)**

Operational definition: In this study, the term Science Achievement involves performance of students in science subject as indicated by their test scores.

LEARNING STYLES

"Learning style is the way in which each learner begins to concentrate on, process, absorb, and retain new and difficult information**" (Dunn & Dunn as cited in Dunn & Burke, 2008, p.**

Operational Definition: Learning style is one of the few different ways that students can learn to make learning easier and to memorize content over a long period of time.

REFLECTIVE OBSERVATION

Reflection on learning during and after one's experiences is an integral component of the learning process. This reflection leads to analysis, critical thinking, and synthesis **(Schon, 1983; Boud, Cohen, & Walker, 1993).**

Operational Definition: Students reflect on the experience, identifying any connections, inconsistencies, or alignment between the experience and their prior knowledge.

SECONDARY SCHOOL STUDENTS

In the proposed study 'Secondary School Students' denotes students of class IX of CBSE Board School that covers students of age groupbetween14-16 years.

1.6.0 OBJECTIVES OF THE STUDY

The research is planned to realize the following objectives:

1. To conduct content analysis of class IX science textbook.

2. To prepare lesson plans using Experiential learning Method for teaching science.
3. To study the effect of experiential learning on the academic achievement in science of secondary school students.
4. To study the effect of experiential learning on learning styles in science of secondary school students.
5. To study the effect of experiential learning on Reflective observation in science of secondary school students.

1.7.0 HYPOTHESES OF THE STUDY

1. Ha1-There will be a significant effect of experiential learning on academic achievement of the Secondary School Students.
2. Ha2-There will be a significant effect of experiential learning on learning stylesof the Secondary School Students.
3. Ha3-There will be a significant effect of experiential learning on reflective observation of the Secondary School Students.

1.8.0 DELIMITATION OF THE STUDY

The study will be delimited in the following respects:

1. The present study will be delimited to Agra city.
2. The present study will be delimited to the CBSE Board schools.
3. The present study will be delimited to IX class students.
4. The present study will be delimited to science subject.

1.9.0 VARIABLES OF THE STUDY

The study will include the following variables:

1. **Independent Variable**-Experiential learning
2. **Dependent Variable-**Academic achievement, Learning styles, Reflective observation

3. Control Variable- Age, Class, Gender and School setting etc.

1.10.0 METHOD OF THE STUDY

Quasi-Experimental research methods will be used in this study to attain the mentioned goals.

"Experimental method is the description and analysis of what will be or what will occur under controlled conditions". (Best, 1993).

1.11.0 SAMPLE OF THE STUDY

IX class science students will be used as the sample population for this study. It will be separated into two equal groups, with section A serving as the experimental group and section B serving as the control group.

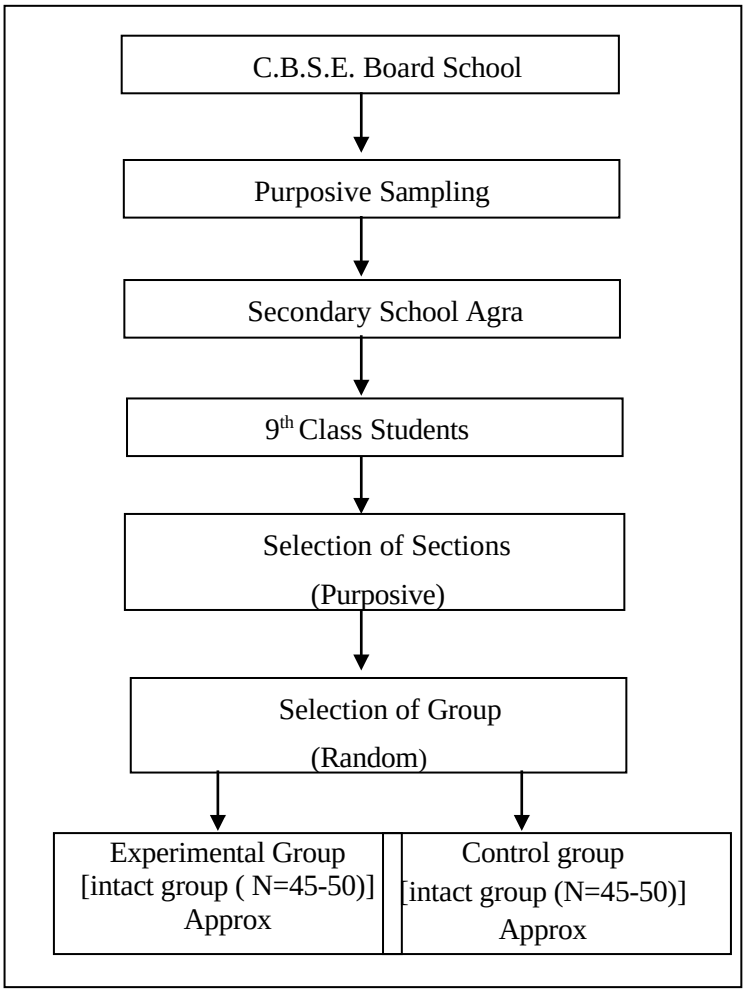

Fig2: Sample of the Study

1.12.0 RESEARCH DESIGN OF THE STUDY

Two group pre-test post-test designs will be used in the present study which will be conducted in three phases:

Phase-1: Planning phase

Phase-2: Implementation phase

Phase-3: Evaluation Phase

Table 2: Research Design of the Study

<table>
<tr><th colspan="6">RESEARCH DESIGN</th></tr>
<tr><td></td><td>PHASE-I</td><td colspan="3">PHASEII- (IMPLEMENTATION PHASE)</td><td>PHASE III- (EVALUATION PHASE)</td></tr>
<tr><td>Groups</td><td rowspan="3">P
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G</td><td>Pre-test</td><td colspan="3">Intervention</td><td>Post-test</td></tr>
<tr><td rowspan="2">Experimental group</td><td rowspan="2">1- Science achievement test
2- Learning style Inventory
3- Reflective Observation</td><td>Treatment</td><td>No. of lesson plans</td><td>Duration</td><td rowspan="2">1- Science achievement test
2- Learning style Inventory
3- Reflective Observation</td></tr>
<tr><td>Teaching science lessons through Experiential Learning</td><td>20</td><td>2 months</td></tr>
<tr><td>Control Group</td><td>1- Science achievement test
2- Learning style Inventory
3- Reflective observation</td><td colspan="2">Science teaching through traditional method</td><td>2 months</td><td>1- Science achievement test
2- Learning style Inventory
3- Reflective Observation</td></tr>
</table>

1.13.0 STEPS TO DEVELOP LESSON PLANS BASED ON EXPERIENTIAL LEARNING METHOD: -

The steps are as follows:

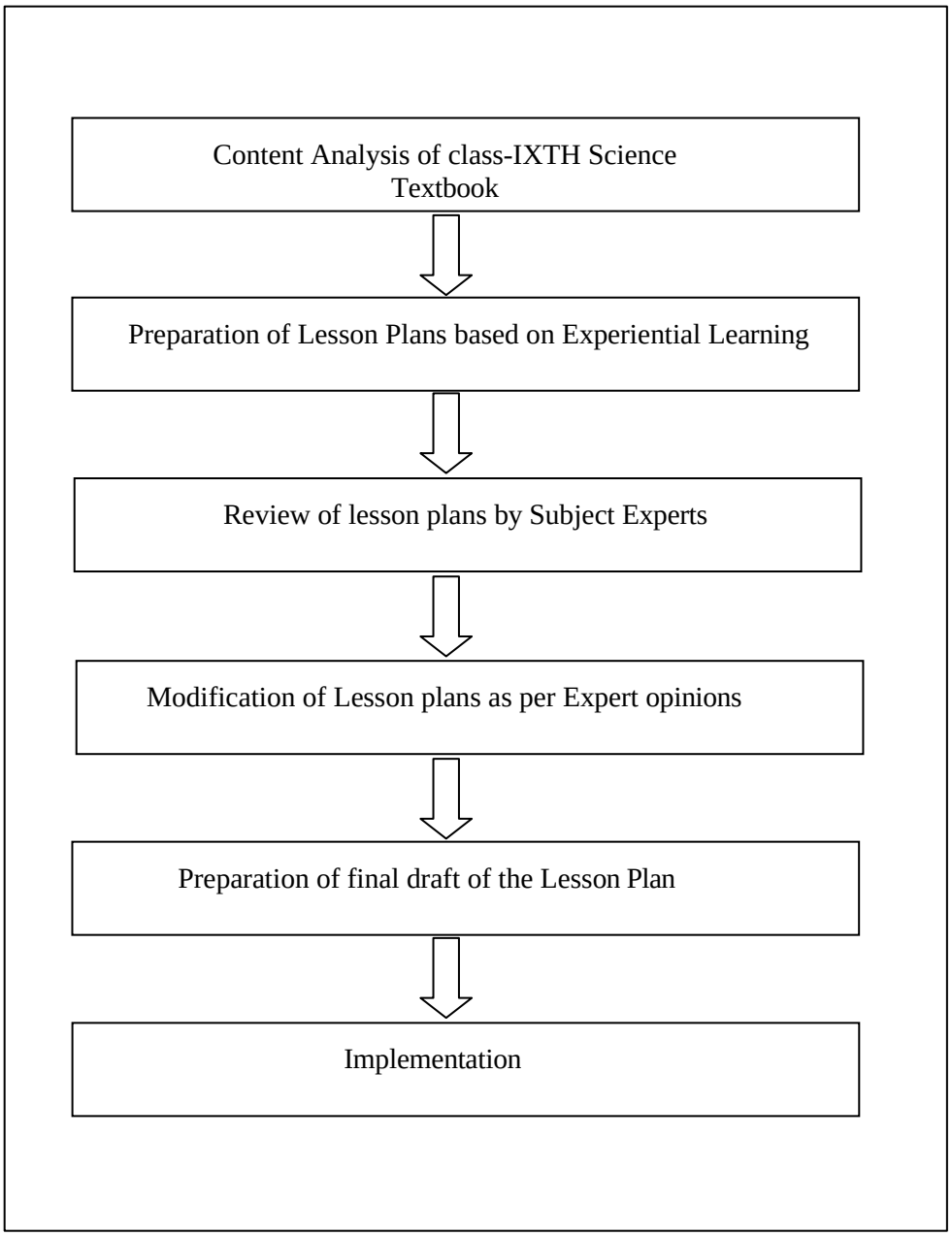
Content Analysis of class-IXTH Science Textbook
Preparation of Lesson Plans based on Experiential Learning
Review of lesson plans by Subject Experts
Modification of Lesson plans as per Expert opinions
Preparation of final draft of the Lesson Plan
Implementation

Fig3: Steps for development of Lesson Plans

1.14.0 PROCEDURE OF THE STUDY

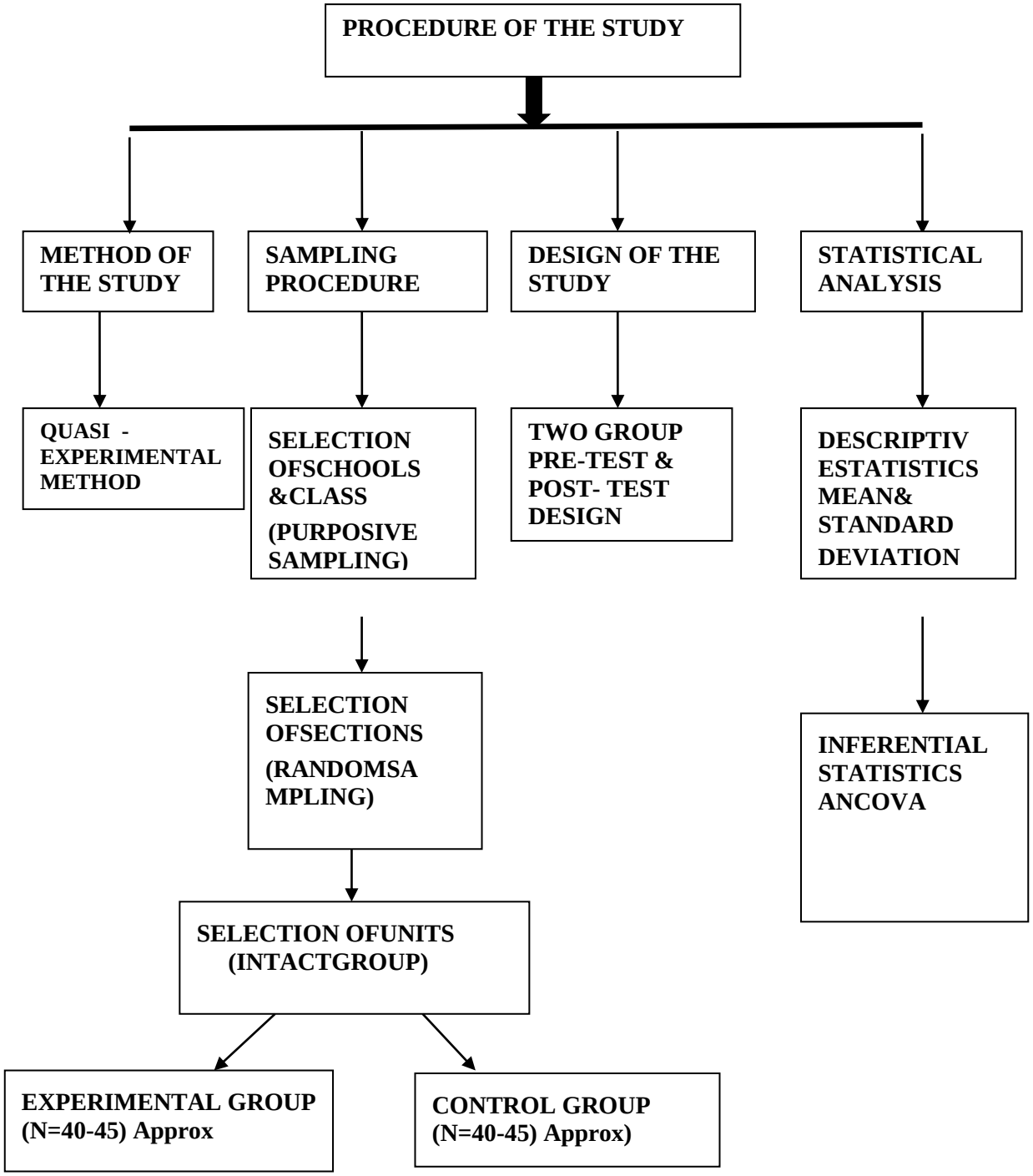

Fig 4: Procedure of the study

1.15.0TOOLS TO BE EMPLOYED IN THE STUDY:

- **SCIENCE ACHIEVEMENT TEST**

Table 3: Survey Table of Science Achievement Test

Sr. No	Tool	Author	Year	Level
1.	**Science Achievement test**	**Moni Yadav and Ananthula Raghu**	**2019**	**Secondary level (9th class)**
2.	Achievement test in science	S.C. Gakhar and Rajnish	2011	Secondary Level
3	Science Achievement test	R.D. Singh	2006	Secondary level

As per the requirement of the study, Science Achievement Test by Moni Yadav and Ananthula Raghu of class IX was found to be appropriate and according to my research.

- **LEARNING STYLE TOOL**

Table 4: Survey Table of Learning Style Tool

Sr. No	Tool	Author	Year	Level
1.	**Learning Style Inventory**	**Karuna Shankar Mishra**	**2012**	**9thclass to PG**
2.	Style of Learning and Thinking	D. Venkataraman	Not available	Higher Level
3	Reflective Learning Scale	Pravat Kumar Sahoo and Sesadeba Pany	2023	Middle Level

As per the requirement of the study, Learning style tool by Karuna Shankar Mishra of class IX was found to be appropriate and according to my research.

- **REFLECTIVE OBSERVATION–Self Constructed tool**

1.16.0 STATISTICAL TECHNIQUES

The following statistical techniques will be used for analyzing the data:

DISCRIPTIVE STATISTICS

Mean: Mean value will be calculated for the distribution of achievement scores, learning style scores and reflective observation scores

Standard Deviation: It will be calculated to study the variation in the scores.

INFERENTIALSTATISTICS

t-test: Inferential Statistics techniques such as t-test will be employed for testing significance of the difference between the experimental and control group on the bases of pre-test, post-test scores.

1.17.0 SIGNIFICANCE OF THE STUDY

The current study may be significant because:

- It will allow students to freely share their thoughts in class.
- It will inspire learners and meet their needs, fostering enthusiasm and a variety of learning methods.
- It will also help students perform better in science classes.
- Motivate Students to participate actively in learning process. Along with active participation, this method will help in improving their way of observation, learning styles and achievement.
- Students' interest in science will grow as a result of Experiential Learning.
- Students will benefit from being able to learn at their own speed.
- It will make the learning experiences richer and more meaningful for students.
- It will help to learn the skills of science as well as science content.

1.18.0 EDCATIONAL IMPLICATIONS

- Teachers can utilize Kolb's (1984) learning stages and cycle to build more effective learning opportunities and to analyze the normal learning chances accessible to students.
- Educators must make sure that activities are planned and executed in a way that allows each student the opportunity to participate in the way that best suits them.
- By identifying the learning styles that are less desired by a student and fostering those patterns through the use of the experiential learning cycle, a student may be assisted in learning more successfully.
- Students are better able to relate concepts and information taught in the classroom to actual circumstances when they are involved in practical activities and reflection.

  When students participate in experiential learning opportunities, they gain:

- A deeper comprehension of the course material
- Insight in to their own skills, interests, passions, and values
- Opportunities to collaborate with diverse learners.
- Self-confidence and other life skills.

1.19.0 CONCLUSION

After analyzing a wide range of literature, the researcher sees the necessity to carry out the current investigation. The researcher found that teaching science subject with experiential learning and its effects on academic achievement, learning styles and reflective observation has been explored to a very little extent, although studies on Experiential Learning (as whole) have been conducted. The researcher could find very few experimental researches on reflective observation at secondary school level, therefore this research aims to study the effectiveness of Experiential learning on Academic Achievement, learning styles and reflective observation in science of secondary level students.

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